Machine Learning in Predictive Maintenance towards Sustainable Smart Manufacturing in Industry 4.0

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Abstract

Recently, with the emergence of Industry 4.0 (I4.0), smart systems, machine learning (ML) within artificial intelligence (AI), predictive maintenance (PdM) approaches have been extensively applied in industries for handling the health status of industrial equipment. Due to digital transformation towards I4.0, information techniques, computerized control, and communication networks, it is possible to collect massive amounts of operational and processes conditions data generated form several pieces of equipment and harvest data for making an automated fault detection and diagnosis with the aim to minimize downtime and increase utilization rate of the components and increase their remaining useful lives. PdM is inevitable for sustainable smart manufacturing in I4.0. Machine learning (ML) techniques have emerged as a promising tool in PdM applications for smart manufacturing in I4.0, thus it has increased attraction of authors during recent years. This paper aims to provide a comprehensive review of the recent advancements of ML techniques widely applied to PdM for smart manufacturing in I4.0 by classifying the research according to the ML algorithms, ML category, machinery, and equipment used, device used in data acquisition, classification of data, size and type, and highlight the key contributions of the researchers, and thus offers guidelines and foundation for further research.